

A case of food supply chain management with AHP, DEMATEL, and TOPSIS

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Abstract

The bullwhip effect leads to considerable inefficiencies along the food supply chain such as missed production schedules, poor customer service, excessive inventory, and misguided capacity plans. To tackle this problem, it is necessary, apart from other interventions, to continuously monitor the performance of food suppliers so that the demand information flow, order batching, transportation planning, and inventory management can be substantially improved. Therefore, supplier assessment has then become critical decision-making support for identifying and addressing inefficiencies of food providers, which ends up reducing the variation of several key logistics parameters for upstream members of the food supply chain. In addition, such assessment is of multicriteria nature given the presence of several criteria from different domains and various food suppliers. With these considerations in mind, this paper proposes a hybrid approach integrating the analytic hierarchy process (AHP), decision-making trial and evaluation laboratory (DEMATEL), and the technique for order of preference by similarity to ideal solution (TOPSIS) for evaluating the performance of pork suppliers. Thereby, the economic and operational burden caused by the bullwhip effect throughout the pork supply chain can be alleviated. AHP was first used to determine the criteria and subcriteria weights. Then DEMATEL was applied to assess the interdependence and feedback between the decision elements. Finally, TOPSIS was implemented to discriminate between high-performance and low-performance pork suppliers. A case study from the Colombian pork supply chain is presented to validate the proposed approach. The results of this study evidenced that the most important criterion was the “service level” and the most influencing factor was the “financial profile.” In addition, based on the supplier assessment results, improvement plans, and new negotiation, strategies were established for each supplier in order to diminish the bullwhip effect along the pork supply chain.

Keywords

AHP, bullwhip effect, DEMATEL, Food industry, multicriteria decision-making (MCDM), TOPSIS